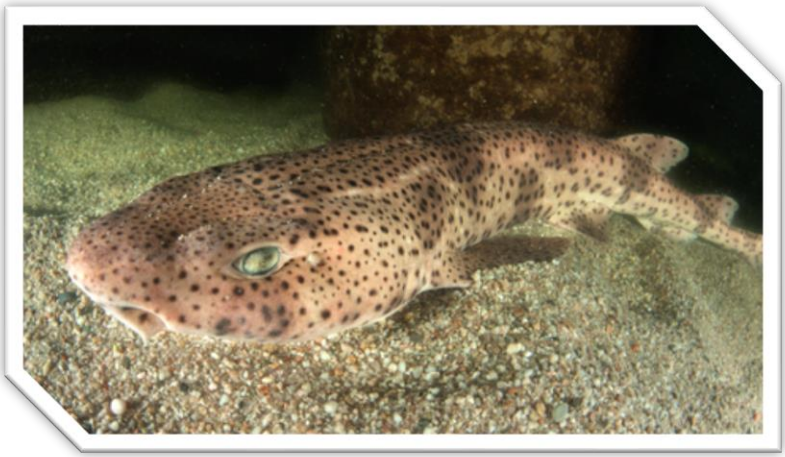
Sharks



Sharks are part of the group known as *Elasmobranchs* (Wilga et al., 2007). *Elasmobranchii* are one of the main groups of chondrichthyan fishes, next to *Holocephali* or chimeras (Wilga et al., 2007). Sharks are known as the *Selachii* sub-group within the larger group of the Elasmobranch, which also contains Rays and Skates (Wilga et al., 2007). It can be discussed whether or not sharks can be considered top-predators in the North Sea, as this study found evidence of sharks being predated by other 'true' top-predators. This, however, only occurred very rarely and mostly when the sharks is not fully grown, which could suggest that full-grown sharks can be considered top-predators. For these reasons, this study will henceforth refer to sharks as 'near top-predators'. An example of species that can be found in the North Sea are: the Basking shark (Cetorhinus maximus), Thresher shark (*Alopias vulpinus*), and Kitefin shark (*Dalatias licha*) (Austin et al., 2019; George, 2009). No research was found that suggested that species have disappeared or invasive species that have taken hold in either sea. Most species of shark are migratory in their behaviour (Wilge et al., 2007).

History/ Population trends

Throughout their evolutionary history during at least 400 million years, the cartilaginous fishes (*Chondrichthyes*) in general, and sharks in particular, remained major components of marine communities, having the ability to adapt to varying selective pressures (Wilga et al., 2007). However, elasmobranchs are considered particularly vulnerable to anthropogenic pressures as their life-history traits result in low rates of population growth (Walker & Hislop, 1998; Sguotti et al., 2016). To grasp the extent to which humans can affect Elasmobranchii, there have been data reviews and surveys made on the group since the late 20th century. According to the information that was gathered elasmobranch landings have fluctuated between high and low landings since the 1930s, seeing relative stabilization in the years following 1970 (Walker & Heessen, 1996).

Miscellaneous

- The Basking shark is the second largest species of fish in the world (Austin et al., 2019). The largest species of fish in the world is the Whale shark (*Rhincodon typus*)(Colman, 1997).
- Sharks frequently lose and replace their teeth throughout their life (Enax et al., 2012).

Diet

- Cod (George, 2009)
- Whiting (George, 2009)
- Mackerel (George, 2009)
- Herring (George, 2009)
- Sprat (George, 2009)
- Sandeel (George, 2009)
- Crustaceans (George, 2009)
- Small fish (George, 2009)
- Other detritivores (George, 2009)
- Cephalopods (George, 2009)
- Flatfish (George, 2009)
- Annelida (George, 2009)
- Zooplankton (George, 2009)
- Phytoplankton (George, 2009)

Sources

Austin, R. A., Hawkes, L. A., Doherty, P. D., Henderson, S. M., Inger, R., Johnson, L., Pikesley, S. K., Solandt, J., Speedie, C., & Witt, M. J. (2019). Predicting habitat suitability for basking sharks (Cetorhinus maximus) in UK waters using ensemble ecological niche modelling. *Journal of Sea Research*, *153*, 101767. https://doi.org/10.1016/j.seares.2019.101767

Colman, J. G. (1997). A review of the biology and ecology of the whale shark. *Journal of Fish Biology*, *51*(6), 1219–1234. https://doi.org/10.1111/j.1095-8649.1997.tb01138.x

Enax, J., Prymak, O., Raabe, D., & Epple, M. (2012). Structure, composition, and mechanical properties of shark teeth. *Journal of Structural Biology*, *178*(3), 290–299. https://doi.org/10.1016/j.jsb.2012.03.012

George, M. R. (2009). An annotated checklist of North Sea cartilaginous fish species. *Journal of Applied Ichthyology*, *25*, 33–39. https://doi.org/10.1111/j.1439-0426.2009.01303.x

Sguotti, C., Lynam, C. P., García-Carreras, B., Ellis, J. R., & Engelhard, G. H. (2016). Distribution of skates and sharks in the North Sea: 112 years of change. *Global Change Biology*, *22*(8), 2729–2743. https://doi.org/10.1111/gcb.13316

Walker, P., & Heessen, H. J. L. (1996). Long-term changes in ray populations in the North Sea. *ICES Journal of Marine Science*, *53*(6), 1085–1093. https://doi.org/10.1006/jmsc.1996.0135

Walker, P., & Hislop, J. R. G. (1998). Sensitive skates or resilient rays? Spatial and temporal shifts in ray species composition in the central and north-western North Sea between 1930 and the present day. *ICES Journal of Marine Science*, *55*(3), 392–402. https://doi.org/10.1006/jmsc.1997.0325

Wilga, C. D., Motta, P. J., & Sanford, C. P. (2007). Evolution and ecology of feeding in elasmobranchs. *Integrative and Comparative Biology*, *47*(1), 55–69. https://doi.org/10.1093/icb/icm029